SEVERAL NEW SPECIES OF WESTERN TRICHOPTERA

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Recent collections of caddisflies studied by the writer have revealed several new species and some interesting distributional records. Six new species in the Rhyacophilidae, Philopotamidae and Psychomyiidae are described herein. All of the new species described are from the western montane region. Unless indicated otherwise, types are in the collection of the writer.

Grateful acknowledgement is made to Dr. C. P. Alexander of the University of Massachusetts, the late Mr. Harry P. Chandler, and Mr. K. M. Fender of McMinnville, Oregon, for collecting and sending me the majority of the specimens studied in this paper.

Rhyacophila wallowa Denning, new species

This species is a member of the *vao-acropedes-inculta* complex. It can be separated from *vao,* its closest relative, by the abruptly constricted basal segment of the clasper, and by the narrow attenuated apical segment of the clasper. In this respect *wallowa* is similar to *acropedes* but differs in the absence of a mesal lobe of the ninth tergum.

Male.—Length 12 mm. Head, body and legs ferruginous, wings about same color except stigma darker and hyaline mottling along margin. *Genitalia* as in fig. 1. Ninth segment annular, approximately same width throughout although very irregular in outline; ninth tergum with no mesal projection, from lateral aspect dorsal margin arcuate. Tenth tergite divided into a pair of narrow blade-like lobes when seen from dorsal aspect, fig. 1B; from lateral aspect structure narrowed distally, slightly upturned. Clasper with basal segment wide at base, abruptly narrowed toward middle and then gradually widened; apical segment with basal heel narrow, distinctly set off from distally narrowed apical portion; when viewed from dorsal aspect mesal edge of apical segment flattened and covered with dense black spinules. Aedeagus with lateral extensile membranous arms terminating in a pad of dense minute reddish setae, fig. 1C; mesal plate between arms attenuated and tubular.

Holotype male, Wallowa River, Wallowa County, Oregon, July 15, 1949, Grace H. and John L. Sperry.

The *Rhyacophila acropedes* complex contains four western species possessing a similar tenth tergite, clasper and lateral arms of the aedeagus. On the basis of the male genitalia these species may be separated as follows:

1. Ninth tergite with a prominent mesal process extending over a portion of tenth tergite 2

Ninth tergite without a mesal process 3

2. Basal segment of clasper wide throughout, apical segment of clasper with distal portion wide and rounded .... *inculta* Ross
   Basal segment of clasper abruptly narrowed, distal portion of apical segment narrowed .... *acropedes* Banks
3. Basal segment of clasper only slightly narrowed, heel of apical segment wide .... *vao* Milne
   Basal segment of clasper abruptly narrowed, heel of apical segment narrow .... *wallowa* Denning

Rhyacophila vao and *inculta* have a wide distribution throughout Western United States and Canada. *Rhyacophila acropedes* has a similar distribution but is also found in the New England States and Labrador with at present no intermediate distributional records available.

Rhyacophila chandleri Denning, new species

This species bears little resemblance to other described species. *Rhyacophila chandleri*, one of the more generalized species, can readily be separated from other species by the massive tenth tergite, the peculiar hammer-shaped dorsal structure of the aedeagus and the narrow quadrilateral apical segment of the clasper.

Male.—Length 10 mm. Wings light brown with several scattered luteous spots, the most conspicuous is triangular and located at the radial sector. Body, antennae and legs a trifle darker than wings. *Genitalia* as in fig. 2. Ninth segment slender throughout except for a wide emargination laterally to receive clasper. Tenth tergite superficially appears as an integral part of the ninth tergum, it is massive extending beyond basal segment of clasper, obtuse apex projected dorso-caudad; from dorsal aspect, fig. 2B, quadrate, distal margin widely emarginate; from ventral aspect mesal surface concave. Clasper with basal segment very wide at base, slightly longer than apical segment; apical segment approximately same width throughout, margins parallel-sided, apical margin circular, setae sparse. Aedeagus, fig. 2C, with dorsal portion deltoid and subacute, bearing internally an extrusible black spine; ventral portion tubular and short, bearing internally a fairly large reddish-brown structure which is partially extruded in the specimens examined.

Holotype male, SACRAMENTO RIVER, SISKIYOU COUNTY, CALIFORNIA, ELEVATION 3200 FEET, Sept. 9, 1953, H. P. Chandler. Paratype male, same data as for holotype. Holotype deposited in the collections of the California Academy of Sciences, San Francisco, California.

This species is named in honor of the late Harry P. Chandler, who not only collected this species but who also collected large numbers of aquatic insects from western United States. Through his collections and studies of aquatic insects Mr. Chandler made many noteworthy contributions to our knowledge of the aquatic fauna.

Rhyacophila pichaca Denning, new species

This species may easily be distinguished from its nearest relative, *visor* Milne, by the slender acuminate lobes of the tenth tergite, by the narrow apical segment of the clasper and by the complex aedeagus which lacks the hook-like mesal process of *visor*.

Male.—Length 7 mm. Wings brownish, stigma of both pair of wings dark due to dense pubescence. Legs about same color as wings except the spurs of second and third pair which are dark brown. Body, head and antennae blackish. Sixth abdominal sternite with a short black spine, seventh sternite with prominent yellowish mesal tooth. *Genitalia* as in fig. 3. Ninth segment with sternum narrow, dorsal portion considerably expanded, ninth tergum extended caudad as a short, blunt hood-like angulation. Tenth tergite consists only of a pair of prominent lateral hook-like acuminate prongs, from dorsal aspect fig. 3B, prongs gradually convergent but not confluent. Basal segment of clasper shaped as a parallelogram, about same width throughout; apical segment short, directed ventro-caudad, dorsal corner round, apex narrowed and obtuse, setae sparse. Aedeagus fig. 3C, partially retracted into eighth and ninth segments, and presenting a complicated structure. It consists of: (1) a pair of dorsal semi-membranous structures, apically truncate, distal margins lightly sclerotized; (2) middle lobe heavily sclerotized, flattened and thin, distally abruptly curved dorsad, from ventral aspect apex bilobed; (3) a heavily sclerotized distally flattened structure, apex narrow and acute and bearing along lateral surface a pair of short, acute, membranous processes, from ventral aspect apex acute and attenuated.

Holotype male, CASCADE HEAD EXPERIMENT FOREST, TILLAMOOK COUNTY, NEAR OTIS, OREGON, July 27, 1951, K. M. Fender. Paratype male, same data as for holotype. Washington: Olympic Hot Springs, Boulder Lake, July 20, 1953, C. P. Alexander, 1♂.

Rhyacophila lineata Denning, new species

In many respects this species is quite similar to *celina* to which it is related. However, certain details of the male genitalia, such as the tenth tergite, the apical segment of the clasper and the complicated aedeagus will easily distinguish this species.

Male.—Length 11 mm. Wings fuscous, with irregularly scattered hyaline areas, especially along margins, body and appendages trifle lighter in color, maxillary palpi considerably darker. Seventh sternum with short mesal spine. *Genitalia* as in fig. 4. Ninth segment irregular in outline, sternum narrower and only slightly indented to receive clasper. Tenth segment complex, consisting of (1) a short dorsal projection which appears triangular and pointed from lateral aspect, but from dorsal aspect, (1), fig. 4, structure projects caudad as a quadrate flap; (2) next, a lightly sclerotized structure, distal portion slender, practically same width throughout, apex acute, from dorsal aspect, (2), fig. 4, appears as a narrow attenuated sclerite distally; ventral lobe wide covering most of structure, somewhat circular in outline; (3) next, a heavily sclerotized structure pigmented black along distal margin, apex blunt and curved dorsad; from dorsal aspect, (3), fig. 4, structure is bilobed, apices convergent; (4) ventral structure also heavily sclerotized, black pigmentation along apical margin, apex truncate, (4), fig. 4; from caudal view lateral lobes closely appressed forming a tubular structure. *Clasper* very short, both segments about same length, basal segment rhomboidal; apical segment ovoid, mesal surface concave, covered with heavy pubescence except near distal margin a line of no pubescence thus forming a distinct light-colored line. Aedeagus short, retracted into ninth segment and difficult to discern, consisting of two wide lateral sheaths, tapering distally, lateral lobes enclose a dorsal spine-like structure and a short ventral structure.

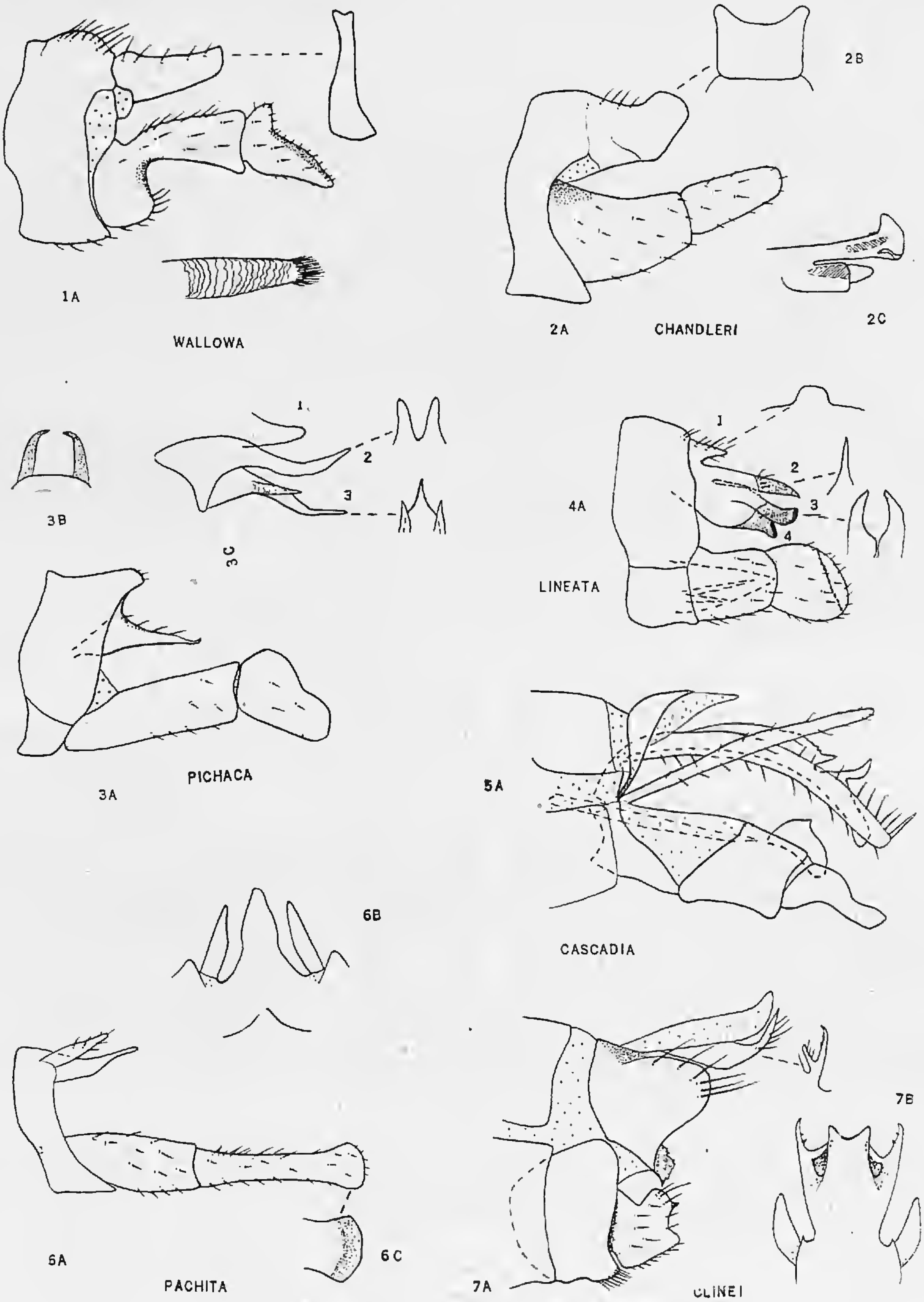
Holotype male, CASTLE CRAGS STATE PARK, SHASTA COUNTY, CALIFORNIA, June 13, 1950, *L. W. Quate*. Holotype deposited in collection of University of California, Berkeley, California.

Tinodes cascadia Denning, new species

This species is a member of the *parvula, signodana, siskiyou* complex and represents the seventh Nearctic species in the genus. The species may be distinguished from *parvula*, its closest relative, by the small, dome-like mesal blade of the clasper, by the dentate dorsal processes of the aedeagus and the short ninth tergite.

Male.—Length 5 mm., this being one of the smallest *Tinodes* known. Wings uniformly fuscous, appendages a trifle darker in color, palpi brownish and hairy. Front tarsi without pre-apical spur, spurs fuscous and hairy. *Genitalia* as in fig. 5. Ninth tergum produced dorso-caudad as a short triangular lobe, from dorsal aspect apex acute, apical and lateral margin fringed with a membranous sheath. Ninth sternum sub-triangular, produced ventro-caudad, from ventral aspect distal margin wide and straight. Cerci elongate, fusiform, extending caudad as far as any other part of genitalia. Basal segment of clasper somewhat quadrate with ventral margin considerably wider than dorsal, connected to ninth sternum by a membranous lobe; apical segment slender, irregular, dorso-basal portion rounded, apical portion narrowed and directed ventro-caudad, from ventral aspect apices not convergent, mesal corner of apex bearing a short black spine. Mesal blade of claspers with dorsal margin dome-shaped and produced dorsally into an acute apex, distal portion narrow, apex obtuse and curved ventrad, from ventral aspect lobes are closely appressed and apex thus appears bilobed. Sheaths of aedeagus—probably all that remains of the tenth tergite—long, slender, apex obtuse, armed with prominent and abundant setae, especially a wide spine-like seta at apex; aedeagus with apex narrowed, a pair of teeth-like processes arise sub-apically and near their base a short spinous process.

Holotype male, CASCADE HEAD EXPERIMENTAL FOREST, NEAR OTIS, OREGON, July 27, 1951, K. M. Fender.



EXPLANATION OF FIGURES

Fig. 1. *Rhyacophila wallowa*, male genitalia; 1A, lateral aspect. Fig. 2. *Rhyacophila chandleri*, male genitalia; 2A, lateral aspect; 2B tenth tergite, dorsal aspect; 2C, aedeagus, lateral aspect. Fig. 3. *Rhyacophila pichaca*, male genitalia; 3A, lateral aspect; 3B, tenth tergite, dorsal aspect; 3C, aedeagus. Fig. 4. *Rhyacophila lineata*, male genitalia; 4A, lateral aspect. Fig. 5. *Tinodes cascadia*, male genitalia; 5A, lateral aspect. Fig. 6. *Wormaldia pachita*, male genitalia; 6A, lateral aspect; 6B, tenth tergite, dorsal aspect; 6C, apex, apical segment of clasper. Fig. 7. *Polycentropus clinei*, male genitalia; 7A, lateral aspect, 7B, tenth tergite, dorsal aspect.

KEY TO NEARCTIC TINODES

Males

1. Apical segment of clasper deeply emarginate, resulting in a wide basal portion, and a narrow oblique apical portion.......... *siskiyou* Denning

Apical segment slender throughout, much narrower than basal segment 2

2. Apical segment of clasper pointed and oblique at apex, dorsal spur near apex .... *signodana* Ross

Apical segment slender and rounded or truncate at apex.......... 3

3. Apical segment slender and truncate at apex.......... 4

Apical segment slender and rounded at apex.......... 5

4. Mesal blade of basal segment of clasper broadly curved dorso-caudad, apex aedeagus bifid.......... *parvula* Denning

Mesal blade of basal segment of clasper short, dome-like with an acute dorsal apex, apex aedeagus not bifid.......... *cascadia* Denning

5. Apical segment of clasper elongate and sinuous, as long or longer than basal segment .... *belisa* Denning

Apical segment of clasper not any longer than basal segment, somewhat sausage-shaped 6

6. Mesal blade of basal segment of clasper short, widely curved caudad .... *provo* Ross

Mesal blade of basal segment of clasper long and narrow, curved ventro-caudad .... *consueta* McLean

Wormaldia pachita Denning, new species

Wormaldia pachita is a member of the Moesta group and represents the thirteenth Nearctic species in the genus. Along with *anilla* (Ross), *cruzensis* (Ling) and *hamata* Denning it belongs to the subgroup of the genus in which the seventh and eighth sternites are without mesal projections. However, the general appearance of the genitalia bear closest resemblance to *strota* (Ross) and *sisko* (Ross) in possessing a long apical segment of the clasper. The spatulate apical segment of *pachita* will easily separate it from other described species.

Male.—General color flavescent. Seventh sternite with no mesal process. Eighth segment normal, no sternal mesal process. *Genitalia* as in fig. 6. Ninth segment narrow throughout, dorsum indented to receive tenth tergum and cerci; sternum produced caudad considerably beyond remainder. Tenth tergite carinate, seen from lateral aspect, fig. 6, structure gradually narrowed to a sub-acute apex, projecting caudad slightly beyond ninth sternite; from dorsal aspect, fig. 6B, structure elongate, triangular, gradually narrowed to a sub-acute apex, projecting caudad slightly beyond ninth sternite; setation sparse. Cerci slender, digitate, slightly shorter than tenth tergite, acute apically; setae sparse. Clasper with basal segment considerably shorter and stockier than apical segment; apical segment elongate, constricted along middle, spatulate and apical margin circular. Mesal pad of mesal surface of apical segment of clasper, fig. 6C, consists of a narrow band of short dense reddish brown spicules. The genitalia and specimen have been damaged.

Holotype male, GRASS VALLEY, NEVADA COUNTY, CALIFORNIA, ELEVATION 2350 FEET, May 5, 1946, H. P. Chandler. Holotype deposited in the collection of the Academy of Sciences, San Francisco, California.

KEY TO NEARCTIC WORMALDIA[1]

Males

1. Tenth tergite divided into a pair of heavily sclerotized hooks.......... *major*
   Tenth tergite not heavily sclerotized and at most only slightly hooked 2
2. Tenth tergite with a basal hump and clavate distally.......... *arizonensis*
   Tenth tergite not clavate distally.......... 3
3. Seventh sternite having a long, narrow apico-mesal process.......... 4
   Seventh sternite having a triangular process broad at base, or none.. 5
4. Eighth sternite with a long apico-mesal process.......... *moesta*
   Eighth sternite with only a short process or none.......... *gabriella*
5. Eighth tergum normal 6
   Eighth tergum with long dorsal elongation.......... *hamata*
6. Seventh sternite with a triangular process.......... 7
   Seventh sternite with no mesal process.......... 10
7. Clasper elongate, basal segment considerably longer than tenth tergite 8
   Clasper short and stocky, basal segment equal to or but slightly longer than tenth tergite 9
8. Apical segment shorter than basal segment.......... *sisko*
   Apical segment equal to basal segment, dorsal margin markedly convex .... *thyria*
9. Apical segment of clasper much longer than basal segment.......... *shawnee*
   Apical segment of clasper slightly shorter than basal segment.... *occidea*
10. Basal segment elongate, longer than tenth tergite.......... 11
    Basal segment short, not longer than tenth tergite.......... 12
11. Tenth tergite truncate, hooked ventrad at apex, mesal pad on apex of apical segment of clasper with short black setae.......... *strota*
    Tenth tergite with apex acute, mesal pad on apex of apical segment of clasper with short reddish brown setae.......... *pachita*
12. Apical segment of clasper markedly constricted beyond middle...... *anilla*
    Apical segment of clasper parallel-sided.......... *cruzensis*

POLYCENTROPUS CLINEI Milne

The genus Polycentropus is represented in the United States and Canada by 29 recognizable species. All but one of these, *Polycentropus clinei,* is readily identifiable from available keys and illustrations.

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[1] Adapted from Ross, 1949, Proc. Ent. Soc. Wash. 51(4) :158.

The male genitalia of this species, fig. 7, is apparently quite variable. The mesal lobe of the ninth sternum may be as short as in fig. 7, or long, projecting caudad to distal margin of the claspers; dorso-mesal lobe of clasper may be short as in figure or long and slender. However variable certain details of the male genitalia may be *clinei* is easily recognized by the tenth tergite, especially when viewed from dorsal aspect, fig. 7B. The bilobed lateral lobes, and the widely emarginate mesal lobe will distinguish *clinei* from other species.

Previously known only from the New England states *clinei* is here recorded from Halifax County, Nova Scotia, June 26, 1951, C. P. Alexander.

POLYCENTROPUS ARIZONENSIS Banks

Previously recorded only from Arizona. It is here recorded from New Mexico: Whitewater Canyon, near Glendwood, Aug. 20, 1953, H. B. Leech.

POLYCENTROPUS SMITHI Denning

This species was originally described from Mt. Washington, New Hampshire. The collection of *smithi* in the Yukon Territory would suggest a holarctic distribution. It is here recorded from: Yukon Territory, along Alaska Highway, Mile Post 1012, July 4, 1952, C. P. Alexander.

DRAPETIS TRICHURA MELANDER IN CALIFORNIA

(Diptera: Empididae)

A single male specimen of *Drapetis trichura* Melander 1918 was swept from desert plant growth at Palm Springs, Riverside County, California, on December 25, 1952 (P.H.A.). The determination was kindly made by Dr. A. L. Melander. Dr. Melander informed the writer that this is the second specimen of *trichura* that he has seen. This species was described from a male collected at Austin, Texas.—P. H. ARNAUD, *Stanford University.*